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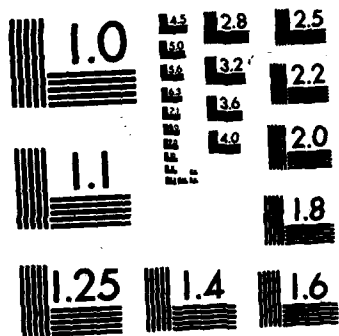
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CAPABILITY AND COST COMPARISON
OF ON-LINE APCAPS AND
THE AIR FORCE PDS-C

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THE AIR FORCE PDS-C

October 1982

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EXECUTIVE SUMMARY

Personnel management at Defense Logistics Agency (DLA) Headquarters is highly dependent upon automated data processing to handle the majority of the data required to administer its civilian workforce and a variety of programs. Furthermore, personnel and pertinent regulations and budgets are continually in a state of change.

The system in use, developed and maintained by the DLA Systems Automation Center (DSAC), is the Automated Payroll, Cost and Personnel System (APCAPS). DLA decided several years ago to develop an on-line version of APCAPS to improve efficiency and responsiveness. In 1979, in order to focus attention on development of the on-line system, DSAC imposed a moratorium on APCAPS enhancements. Since that time a backlog of needed improvements has developed; and the On-line APCAPS still does not exist. This hinders the effectiveness of the Office of Personnel (DLA-K).

This situation makes it logical to ask, as DLA has: Is there not a better way? An alternative which has some appeal is a working Air Force personnel system, the Personnel Data System-Civilian (PDS-C). It could meet most of the needs of DLA-K and could be implemented more quickly than On-line APCAPS.

Despite those advantages, we advise against switching to PDS-C. It will cost significantly more to develop, operate and maintain over a five year period than will On-line APCAPS. The hardware and software environment it requires is inconsistent with DLA's current trend toward decentralized data processing and normalized hardware and software. And it provides no capabilities beyond or superior to those of the planned On-line APCAPS.

We recommend that DLA continue the development and implementation of On-line APCAPS, but on an accelerated schedule so that the needs of DLA-K can be met expeditiously. DLA should direct DSAC to prepare formal development and implementation plans for the personnel portion of On-line APCAPS immediately. Those plans should include dedicated staffing assignments and a milestone schedule that assures implementation of the system by September 1984.

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ii
LIST OF TABLES	v

CHAPTER

1. INTRODUCTION	1- 1
2. EVALUATION CRITERIA	2- 1
Personnel System Requirements	2- 1
Cost Factors	2- 3
3. ANALYSIS RESULTS	3- 1
System Capabilities	3- 1
Costs	3- 4
4. CONCLUSIONS AND RECOMMENDATIONS	4- 1
Conclusions	4- 1
Recommendations	4- 1

APPENDIX

- A. Detailed System Capabilities Analysis Results
- B. Memorandum DSAC-B-82-590
- C. Detailed Cost Analysis

LIST OF TABLES

<u>Table</u>	<u>Page</u>
3-1 Comparison of On-line APCAPS and PDS-C Capabilities with DLA-K Requirements	3- 2
3-2 Cost Analysis Summary	3- 5
A-1 Comparison of Planned On-Line APCAPS Capabilities with DLA-K Requirements	A- 3
A-2 Comparison of PDS-C Capabilities with DLA-K Requirements	A- 4
C-1 Labor Requirements for Development	C- 2
C-2 PDS-C Implementation Chart	C- 7
C-3 PDS-C Hardware	C-10

1. INTRODUCTION

The Defense Logistics Agency (DLA) employs a large civilian workforce at Headquarters and at dispersed field activities. In addition to day-to-day management responsibility for the civilian workforce, the DLA Office of Personnel (DLA-K) administers a number of programs such as training, merit promotion and Equal Employment Opportunity. Because of the masses of data involved in performing these functions, DLA-K depends upon automated data processing (ADP) systems. The major ADP system serving the personnel area is the Automated Payroll, Cost and Personnel System (APCAPS), which has been developed and maintained by the DLA Systems Automation Center (DSAC).

Personnel system requirements are continually being revised because of regulation or guidance and reporting requirements imposed by such organizations as the Office of Management and Budget, the Equal Employment Opportunity Commission and the Office of Personnel Management. The rate at which APCAPS modifications have been implemented has not kept pace with these changing requirements. The highly-integrated system design of APCAPS has proved to be a drawback in terms of the complex relationships that must be considered in program changes. The expenditure of time and effort to make such changes, for either required modifications or improvements, has frequently been greater than anticipated. Additionally, these modifications have consumed DSAC resources that could otherwise be spent on user-requested enhancements.

To remedy this situation, DLA-K reviewed the efforts of other Federal agencies in developing ADP personnel systems that are responsive to user requirements. The civilian personnel system developed and used by the Air

Force, Personnel Data System-Civilian (PDS-C), was considered as it has received wide acceptance by the Federal personnel community. Indeed, several large agencies (including the Department of the Navy and the General Services Administration) have adopted PDS-C for their own use. This effort was to study the feasibility of adopting PDS-C for DLA use by evaluating its capabilities in regard to DLA-K requirements and its cost relative to APCAPS. In addition to DLA-K and DSAC, other DLA organizations, which were directly involved in the study and provided source information to form the basis for this assessment, included: Workforce Effectiveness and Development Division (DLA-KW), Office of Telecommunications and Information Systems (DLA-Z), Information Systems Division (DLA-ZS) and the Administrative Systems Branch (DLA-ZSA).

2. EVALUATION CRITERIA

Evaluation of the personnel system alternatives, On-line APCAPS and PDS-C, was in terms of performance capabilities and overall cost so that an objective choice between the two could be readily made. In this section the evaluation criteria are identified and the scope of the evaluation is discussed.

PERSONNEL SYSTEM REQUIREMENTS

The performance capabilities of the two systems were compared with the system requirements specified by DLA-K. The requirements are set forth in a document entitled "DLA Civilian Personnel Functional Requirements Beyond APCAPS Capabilities," dated 13 July 1982. It presents the needs of Headquarters (HQ) DLA together with a consolidated set of requirements of the field Civilian Personnel Offices (CPOs). The identified HQ and field CPO requirements included overall system capabilities and specific output reports.

To facilitate comparison of the two systems, the requirements were grouped as follows: common overall system requirements were grouped under General Requirements; requirements specified as unique to HQ or the field CPOs were placed under HQ Requirements and Field CPO Requirements, respectively. Appendix A contains a detailed listing and description of the requirements. The General Requirements specify the fundamental nature of the system, such as responsiveness, modularity of design, data protection and back-up measures. The Headquarters Requirements and Field CPO Requirements pertain to capabilities that are unique to either category of system user; these include considerations for transaction processing, data security, data entry and edit procedures and system interfaces.

In addition to overall system requirements, the DLA-K requirements included a number of specific output reports, grouped by functional area. These report requirements could not be evaluated against APCAPS and PDS-C capabilities, primarily because the Air Force could not assist in the examination of existing PDS-C report products (in particular, user-language report software, DESIREs). They viewed the comparison of specific output requirements with the library of existing PDS-C DESIREs as a multi-day endeavor best left until the implementation decision had been made. Although these application requirements are not included in the capabilities analysis, an estimate of the labor necessary to develop the appropriate software is included in the cost analysis. The capability evaluation was based upon the sixteen requirements listed in Appendix A.

DLA-K rated each of the sixteen requirements as to its relative importance. A three-value scale of high, medium and low (assigned the integers 3, 2 and 1, respectively) was used to weight the individual items. These weights were used in computing a numerical score for the system alternatives as described in Chapter 3. The value of the weight assigned to each requirement is presented in that chapter.

The degree to which a system alternative meets a requirement is represented by one of the integers 4, 3, 2 and 0, with the following connotations:

- 4 - Fully meets requirement
- 3 - Almost meets requirement
- 2 - Partially meets requirement
- 0 - Does not meet requirement.

The actual values assigned in the evaluation were obtained by discussing the DLA-K requirements with the system designers at DSAC and AFMPC. The results of this analysis are described in Chapter 3.

COST FACTORS

Both development costs and operations and maintenance (O&M) costs were considered in the evaluation of the system alternatives. Development costs included:

1. Labor (system requirements definition, functional analysis, system design, program design, programming, testing and debugging, documentation, user training, hardware acquisition and installation, data conversion, implementation, and design, programming and testing of interfaces to other subsystems of APCAPS).
2. Hardware (computer system including required peripherals, such as direct access storage, but excluding data terminals at the field CPOs).
3. Site Preparation (installation of flooring, partitions, electrical cabling, fire extinguisher system, and other requirements of computer site).
4. Computer Time (computer resources purchased for programming and testing).
5. Travel (additional staff travel required for system development).

O&M costs included:

1. Labor (maintenance of software and staffing of the central computer site).
2. Computer Time (computer resources purchased for operation of the system in production mode).
3. Hardware Maintenance (hardware maintenance service purchased for the central computer equipment).
4. Communications Services (telecommunications network facilities for system operation).
5. Space for Central Site (cost of rented office space for the central computer site).

Costs considered in the evaluation were incremental; i.e., limited to those which would vary significantly between the two alternatives and therefore bear directly on the outcome of the analysis. Cost elements that are expected to be approximately the same under either alternative (such as data

terminals, supplies, and labor expended by personnel specialists in HQ and field CPOs) were not explicitly costed. Hence the cost analysis presented in Chapter 3 does not represent a full accounting of anticipated development and operations expenses. In addition to factors that were assigned explicit costs, a number of other considerations surfacing during the course of the analysis could not realistically be given estimated dollar values. These "intangible considerations" are listed below, grouped according to the alternative that they favor.

Favoring APCAPS:

- PDS-C is designed for and implemented on only Burroughs Corporation computers. DLA currently has none of the required equipment.
- Switching to Burroughs hardware would present DLA with numerous difficulties, including deviating from "normalization" policies, interfacing with an IBM-oriented network (DLANET), and using PDS-C with non-Burroughs terminals.
- Under PDS-C, local operations would be dependent not only on the viability of the central processor, but also on the communications link.
- DLA would not have the same degree of control over systems support provided by the Air Force as it has over support provided by DSAC.
- Continued support for the "old" PDS-C systems may be more difficult to obtain when the Air Force finally implements Phase IV (a project to provide all Air Force bases with new computers).
- In view of the frequent interplay between the payroll and the personnel functions, it would seem more logical to implement both on the same system. An evaluation of the Air Force payroll system was outside the scope of our study.

Favoring PDS-C:

- PDS-C is a proven system, being used by Air Force (AF) and Defense Mapping Agency, selected for use by General Services Administration (GSA), Navy, and Small Business Administration, and being considered by others, including the Army.

- The personnel system itself could be on-line using PDS-C in perhaps 1½ years, whereas APCAPS would be implemented incrementally over a longer time period.
- The Air Force, having an existing product, is in a better position to schedule delivery milestones.
- The design of PDS-C is such that system software changes (resulting from new regulations, for example) could be accomplished more easily by Air Force systems support than by DSAC.
- The final implementation of Phase IV is not likely to occur before 1988, and even then there may be enough non-Air Force users of PDS-C to assure indefinite support.

Considerations such as the above, though they are indirectly related to the cost of the system, have a major bearing on the choice between On-line APCAPS and PDS-C. Further analysis of their impact was beyond the scope of our study. DLA should examine these matters closely because some of these considerations may represent a greater cost to DLA than the direct cost factors we have studied.

3. ANALYSIS RESULTS

SYSTEM CAPABILITIES

In a comparison of the capabilities of the APCAPS and PDS-C alternatives to meet DLA-K's requirements, of particular importance is a specific description of the systems. The PDS-C system is understood to denote the existing Air Force system, modified in response to Navy and GSA requests to a design which embodies a single central site, accessed by the local offices over communications lines. Based on the volume of civilian personnel actions, that design can adequately accommodate all DLA requirements. The APCAPS alternative, on the other hand, is a projection of the personnel subsystem of APCAPS after it is converted to an on-line mode under a commercially offered data base management system, TIS (Total Information System). The personnel subsystem will continue to be integrated with the cost and payroll subsystems of APCAPS and will be implemented on normalized distributed systems at DLA sites.

Interviews with APCAPS and PDS-C system specialists at DSAC and Air Force Manpower and Personnel Center (AFMPC) led to ratings charts for each system. The system requirements and rating charts are described in Appendix A. They include an abbreviation of a requirement description, the assigned score for the system being evaluated, and a column for remarks. The scores for both systems and the weight assigned by DLA-K to each requirement are tabulated in Table 3-1. That table also shows the final weighted capabilities for each requirement, determined by multiplying the assigned weight by the capability rating.

The total weighted capabilities are similar: 154 for APCAPS and 146 for PDS-C. The five percent difference between the two scores is negligible, more

**TABLE 3-1. COMPARISON OF ON-LINE APCAPS AND
PDS-C CAPABILITIES WITH DLA-K REQUIREMENTS**

REQUIREMENTS*	WEIGHT	CAPABILITIES		WEIGHT x CAPABILITIES	
		APCAPS	PDS-C	APCAPS	PDS-C
<u>General</u>					
1. Inquiry and Report Gen.	3	3	3	9	9
2. Modular Design/Ease of Mod.	3	2	2	6	12
3. Data Security	3	4	4	12	12
4. Data Back-up	3	4	4	12	12
5. Processing Back-up	3	4	3	12	9
6. Individual's Printout (Privacy Act)	3	4	4	12	12
<u>Headquarters</u>					
1. Automatic Update	3	4	4	12	12
2. Invalid Transaction List	3	2	4	6	12
3. HQ Data Security	3	4	4	12	12
4. End-of-Month Tape for OPM	3	2	4	6	12
<u>Field CPO</u>					
1. Local Workspace	2	4	4	8	8
2. Data for Word Processing	2	4	4	8	8
3. Interface w/ APCAPS Payroll	3	4	0	12	0
4. Interface w/ APCAPS Manpower	3	4	0	12	0
5. Edit During Input	3	3	4	9	12
6. Screen-Format Input	2	3	2	6	4
TOTAL OF WEIGHTED CAPABILITIES				154	146

Key to Ratings:

- 4 Fully meets requirement
- 3 Almost meets requirement
- 2 Partially meets requirement
- 0 Does not meet requirement

* Detailed in Appendix A.

a result of the specific numbers used for the rating and weighting scales than of an actual difference in the two systems' capabilities.

Not only were the total scores in Table 3-1 quite close, both alternatives at least partially met almost all of the requirements. The capability most obviously missing is the lack of PDS-C interfaces to the APCAPS Payroll and Manpower subsystems. This is certainly not a surprising omission, and the PDS-C alternative is duly penalized by being charged for the cost of providing this capability.

The most significant weakness of APCAPS (in terms of the requirements analysis) is reflected in its relatively low score for the second General requirement, "Modular Design/Ease of Modification." The present APCAPS system is frequently characterized by DLA-K as being inflexible with respect to the ability to implement software changes or enhancements. Although the system should become more modular when it is converted into an on-line form, the fact that APCAPS is an integrated system supporting personnel and several other functional areas will continue to complicate any APCAPS modifications.

One potentially serious PDS-C deficiency is not identified in the capability/requirement chart: its inability to perform interactive ad hoc retrievals. Although a PDS-C user can construct a DESIRE routine to perform an arbitrary query, that DESIRE is normally processed as part of an overnight batch job. While it is possible to instruct the computer operator to execute a DESIRE immediately, this practice is reserved for exceptional circumstances, as it degrades machine performance. This characteristic had very little impact on the analysis results because DLA-KW specified that the requirement for query turnaround time was overnight.

The analysis of PDS-C and planned APCAPS capabilities shows that both alternatives can be expected to meet DLA-K's general requirements satisfactorily. The development costs in the following section indicate the

difficulty involved in enhancing the systems so that they fully meet the general requirements, as well as writing and implementing new software to meet specific application requirements.

COSTS

The following subsections summarize the costs estimated for each of the personnel system alternatives and point out the major cost differences among the alternatives. Cost of the On-line APCAPS alternative was based upon current understanding of DLA-K system requirements and overall DLA plans for equipment and software standardization. The PDS-C alternative was approached in two ways: 1) Implement PDS-C on a DLA-purchased computer system meeting minimum operating requirements for the software and 2) Implement PDS-C on other Government hardware that could be used under an interagency support agreement. Regulations require that interagency support agreements be considered in any potential procurement analysis.

The cost estimates were based largely upon the figures furnished by DSAC and the Air Force Manpower and Personnel Center. Although no attempt was made to determine the reliability of such estimates based upon past performance, the figures were checked for completeness and verified with other sources whenever possible.

Table 3-2 is the summary page of the cost analysis, showing development, operations and maintenance costs for each of the three alternatives evaluated. The significant categories of development costs are in the top half of Table 3-2. For the purposes of this analysis, the expression "development costs" is used to describe non-recurring costs, incurred up to and including the point of final implementation. The bottom half of Table 3-2 shows the operations and maintenance (O&M) costs that are projected for one year of operation of each alternative. The bottom two rows of the table show the

TABLE 3-2. COST ANALYSIS SUMMARY

Cost Category	Personnel Sub-system of On-line APCAPS	FDS-C on New DLA Hardware	FDS-C on Other Government Hardware
<u>Development Costs</u>			
A. Labor	\$ 479,000	\$ 693,200	\$ 689,300
- Planning and Coordination	28,200	21,000	21,000
- Analysis and Design	299,300	256,700	256,700
- Programming and Testing	88,100	76,800	76,800
- Documentation and Training	48,700	56,600	56,600
- Hardware Acquisition & Installation	-	4,500	600
- Data Conversion	7,900	23,700	23,700
- Implementation	6,800	18,100	18,100
- APCAPS/FDS-C Interfaces	-	235,800	235,800
B. Hardware	-	407,400	60,000
C. Site Preparation	-	530,000	-
D. Computer Time	-	-	50,000
E. Travel	-	4,500	4,500
Total Development Costs	\$ 479,000	\$1,635,100	\$ 803,800
<u>Annual Operations & Maintenance Costs</u>			
A. Labor	\$ 235,000	\$ 411,600	\$ 293,700
- Software Maintenance by DSAC	235,000	235,000	235,000
- Software Maintenance by A.F.	-	58,700	58,700
- Central Site Staff	-	117,900	-
B. Computer Time	27,000	-	370,000
C. Hardware Maintenance	-	26,100	2,400
D. Communications Services	-	360,000	392,400
E. Space for Central Site	-	192,000	-
Total Annual Operations & Maintenance Costs	\$ 262,000	\$ 989,700	\$1,058,500
Discounted Total 5 Yr. Operations & Maintenance Costs	\$1,046,200	\$3,951,900	\$4,226,600
Development plus 5 years Operations & Maintenance	\$1,525,200	\$5,587,000	\$5,036,400

total O&M costs for five years (discounted) and the total of development and O&M, respectively.

The costs shown are incremental rather than total costs. Not only are the alternatives not fully costed in the accounting sense, they also exclude certain costs that would be common to all alternatives. For example, printers will have to be purchased for each local processing site, regardless of the alternative chosen; the cost of the printer acquisition is not included for any of the alternatives.

Development Costs

The costs for developing the three alternatives for DLA's use are markedly different. On-line APCAPS will cost less than one-third as much to develop as PDS-C on new DLA hardware and less than two-thirds as much as PDS-C on other government hardware. The chief causes of these differences are labor for software development, hardware and the preparation of a site for that hardware. The development costs for each alternative are characterized below.

On-line APCAPS. Labor for software development is the only cost element for the personnel subsystem of On-line APCAPS. Because of the integrated nature of the APCAPS design, no additional effort is required to develop interfaces between the personnel subsystem and the other subsystems. The system will operate at DLA sites which are already in existence, so no additional hardware or site preparation direct costs are anticipated. Software development is planned to be done on a DSAC development system for which computer time costs are not allocated to projects.

PDS-C on New DLA Hardware. For reasons given in Appendix C, much of the APCAPS development effort will take place even if PDS-C is chosen by DLA. Hence a large part of the labor for software development carries over to the

PDS-C columns of Table 3-2. Additional labor will be required to develop interfaces between PDS-C and the non-personnel subsystems of On-line APCAPS. The interfaces alone represent a 50 percent additional labor cost for PDS-C development.

PDS-C was designed and implemented on Burroughs equipment and cannot be converted to run on non-Burroughs computers without massive reprogramming. DLA currently has no compatible hardware available for the personnel application. Acquiring the hardware, preparing a computer site for it and installing it will cost DLA nearly one million dollars above and beyond software development.

PDS-C on Other Government Hardware. DLA could achieve some savings over implementing PDS-C on new DLA hardware by installing the system on existing Burroughs equipment owned and operated by another agency, such as GSA. Labor costs for development would be much the same as the PDS-C alternative. Some new hardware (disk and tape storage) would have to be acquired, but the site preparation cost would be eliminated. Computer time costs would be incurred for software development. The total development cost for this alternative would be less than half that of the other PDS-C alternative, but would be two-thirds higher than On-line APCAPS.

Annual Operations and Maintenance Costs

In terms of O&M costs, On-line APCAPS is decidedly less expensive than either PDS-C alternative. The major cost advantages of APCAPS have to do with hardware, computer support and data communications. PDS-C on new DLA hardware has more favorable O&M costs than PDS-C on other government hardware primarily because of the expense of purchased computer time. The important differences among the alternatives are identified below.

On-line-APCAPS. The only significant costs for operating and maintaining APCAPS will be labor for software maintenance and a small computer time cost at the operating sites.

PDS-C on New DLA Hardware. The O&M labor element for this alternative is nearly double that of APCAPS. Not only must an operations staff be provided for the central site and maintenance be performed on PDS-C, the interfaces with the rest of APCAPS must be maintained, a task which DSAC believes to equal the task of maintaining the personnel subsystem itself.

While no computer time costs will be incurred under this alternative, the cost of providing space for the central site and of maintaining the computer equipment is considerable. More importantly, DLANET upgrades to support the data communications traffic on the network will be extensive and costly.

PDS-C on Other Government Hardware. This alternative does not incur the cost of a central site staff that the other PDS-C alternative requires. Also, the cost of space for a central site is eliminated and the hardware maintenance costs are greatly reduced.

However, additional data communications services must be provided and computer time must be purchased from the government agency furnishing that service. These factors make this alternative even more expensive than PDS-C on DLA hardware.

Total Costs Comparison

In order to arrive at useful measures for comparing the three alternatives, the total development cost was added to the cost of operations and maintenance for a five-year period. The annual O&M costs were treated as a uniform series of payments for five years; i.e., the annual cost is assumed to be fixed for the five-year period and is equal to the total O&M figure derived in the subsections above.

The present worth of the five payments was obtained using a present worth factor derived from the formula:

$$P = \frac{(1 + i)^n - 1}{i(1 + i)^n}$$

where i represents an annual discount rate fixed over the planning horizon and n is the number of time periods. Under DLA-Z and DLA-K guidance, a discount rate of 8 percent was used and the following value of P was derived:

$$P = \frac{(1 + 0.08)^5 - 1}{0.08(1 + 0.08)^5} = 3.993$$

The present worth factor P was applied to each of the alternative annual O&M costs yielding the following results:

	<u>Total Annual O&M</u>	x	<u>P</u>	=	<u>Present Worth of 5-Year O&M</u>
On-line APCAPS	\$262,000	x	3.993	=	\$1,046,200
PDS-C	\$989,700	x	3.993	=	\$3,951,900
PDS-C at GSA	\$1,058,500	x	3.993	=	\$4,226,600

The total costs of developing, operating and maintaining each alternative were derived by adding the present worth of five years operations and maintenance costs to the development costs, as given below:

	<u>APCAPS</u>	<u>PDS-C</u>	<u>PDS-C AT GSA</u>
Development Costs	\$ 479,000	\$1,635,100	\$ 803,800
Present Worth of 5-Year O&M	<u>1,046,200</u>	<u>3,951,900</u>	<u>4,226,600</u>
Total Development and O&M for 5 Years	\$1,525,200	\$5,587,000	\$5,030,400

Cost Sensitivity

The cost analysis is based upon the best information obtainable within the scope of this study. Several of the major cost factors discussed earlier in this chapter can be reduced or avoided entirely. For example, the

development cost of the "PDS-C on New DLA Hardware" alternative could be significantly reduced if the required computer or peripherals were found as surplus government material. At the time this report was prepared, these particular items did not appear on the surplus property lists.

The differences between the total costs for the alternatives will vary if fringe rates other than 11 percent are used. This difference exists because labor is a major cost element of each alternative and is a different fraction of each alternative's total cost. The Total Development and O&M for 5 Years figures (as shown above) using various composite rates are listed below for the three alternatives.

<u>Rate</u>	<u>APCAPS</u>	<u>PDS-C</u>	<u>PDS-C at GSA</u>
11%	\$1,525,200	\$5,587,000	\$5,030,400
18%	1,615,000	5,719,900	5,133,800
26%	1,717,000	5,871,300	5,251,000
31%	1,780,900	5,966,000	5,324,400
65%	2,215,200	6,610,500	5,823,200

As this shows, changes in this rate have little impact upon the relative standings of the alternatives.

Other sensitivity tests produced similar results. In one case, we doubled the labor estimate for APCAPS development, assumed that the computer and peripherals for PDS-C could be obtained as surplus property and installed in an already-prepared site and that space for the central site would be free. The Total Development and O&M for 5 Years cost was then estimated to be \$2,004,200 for APCAPS in contrast to a total of \$3,882,900 for PDS-C. Only extremely different conditions would change the relative standings of the alternative costs.

4. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Our conclusions are as follows:

1. When fully developed, planned On-line APCAPS will meet most of DLA-K's requirements. Most DLA-K requirements for a personnel system could be met by the existing version of PDS-C, and PDS-C could be implemented for DLA sooner than the currently planned On-line APCAPS. The schedule suggested by AFMPC provides for implementation of the system by September 1984. DSAC plans for completion of On-Line APCAPS are not well formulated. It appears, therefore, that it will not be implemented by September 1984.
2. The design concepts underlying PDS-C are not consistent with two major trends in DLA ADP planning: decentralized data processing and normalization of hardware and software environments for DLA computer facilities. Because of this, adoption of PDS-C may generate costs beyond the direct costs evaluated.
3. The development, operation and maintenance of PDS-C for five years will cost more than three times what the personnel subsystem of On-line APCAPS would cost.

RECOMMENDATIONS

We recommend that DLA take the following actions.

1. We recommend that DLA implement the personnel subsystem and related elements of On-line APCAPS.
2. We recommend that DLA direct DSAC to prepare a formal development and implementation plan for completing On-line APCAPS by September 1984.

User representatives from DLA-K and functional analysts from DSAC-BF should conduct frequent meetings over a two-month period to formalize the personnel system requirements. DSAC should prepare a functional description for On-line APCAPS that incorporates the DLA-K requirements by mid-1983.

DSAC-BF and DLA-ZS should establish a milestone schedule that would ensure development of On-line APCAPS by the September 1984 target date. Finally, DSAC should make staff assignments for the development effort to dedicate key DSAC-BF personnel to the major design and implementation tasks.

APPENDIX A
DETAILED SYSTEM CAPABILITIES
ANALYSIS RESULTS

REQUIREMENTS FOR CIVILIAN PERSONNEL SYSTEM (BEYOND APCAPS)

GENERAL REQUIREMENTS

1. Inquiry and report generation systems that can be used quickly and efficiently by non-programmer personnel staff to develop and execute inquiries and reports. Ability to save frequently-used inquiries and reports for subsequent re-use.
2. System design allowing modification to a subsystem without major disruption of other subsystems (in order to accommodate system enhancements and changes dictated by law, regulation or policy).
3. Protection of certain data items (such as race or national origin) from unauthorized access.
4. Data base back-up procedures to permit restoration in the event of data base damage.
5. Processing back-up capability at another computer site in case of major catastrophe.
6. Ability to produce a complete and understandable printout of an individual employee record in accord with the provisions of the Privacy Act of 1974.

HQ REQUIREMENTS

1. HQ-level data items updated automatically (at least weekly) using transactions from the field CPO data systems. Update process requiring no additional effort by field CPO staff.
2. List of invalid transactions encountered during an update to be printed at both HQ and the submitting CPO.
3. Security protection of HQ-level data against unauthorized interrogation by field CPOs.
4. Ability to generate an end-of-month tape of transactions for the OPM Civilian Personnel Data File.

FIELD CPO REQUIREMENTS

1. Sufficient memory on the computer system to provide a "sizeable work area" for local program use.
2. Ability to extract data from the system for use in separate word processing systems.
3. Interfaces with the APCAPS payroll subsystem.

4. Interfaces with the manpower system.
5. Editing of input data at field CPO at the time of input. Edit software identifying nature of error and prompting for new value.
6. Input data requested via a screen format for any data element transferred directly from an existing manual form.

TABLE A-1. COMPARISON OF PLANNED ON-LINE APCAPS CAPABILITIES
WITH DLA-K REQUIREMENTS

REQUIREMENTS	APCAPS CAPABILITIES	REMARKS
<u>General</u>		
1. Inquiry and Report Generation	3	TIS software
2. Modular Design/Ease of Mod.	2	Would remain largely "integrated"
3. Data Security	4	TIS "ENTIRE" feature provides security
4. Data Back-up	4	
5. Processing Back-up	4	Contingency planning a standard consideration at DSAC
6. Individual's Printout (Privacy Act)	4	Fully labelled record
<u>Headquarters</u>		
1. Automatic Update	4	Planned monthly; could be done weekly
2. Invalid Transaction List	2	Requirement hasn't been assigned; now have separate HQ and field CPO edits.
3. HQ Data Security	4	Part of "ENTIRE" security system
4. End-of-Month Tape for OPM	2	Not large effort to include in design
<u>Field CPO</u>		
1. Local Workspace	4	
2. Data for Word Processing	4	If Four Phase equipment is used
3. Interface w/ APCAPS Payroll	4	
4. Interface w/ APCAPS Manpower	4	
5. Edit During Input	3	
6. Screen-Format Input	3	To be improved under on-line system

Key to Ratings:

- 4 Fully meets requirement
- 3 Almost meets requirement
- 2 Partially meets requirement
- 0 Does not meet requirement

**TABLE A-2. COMPARISON OF PDS-C CAPABILITIES
WITH DLA-K REQUIREMENTS**

REQUIREMENTS	PDS-C CAPABILITIES	REMARKS
<u>General</u>		
1. Inquiry and Report Generation	3	Would use DESIREs, which personnelists would find imposing
2. Modular Design/Ease of Mod.	4	A PDS-C strong point
3. Data Security	4	
4. Data Back-up	4	Tapes with DB and transactions
5. Processing Back-up	3	Would use Interservice Support Agreement but not be DLA facility
6. Individual's Printout (Privacy Act)	4	
<u>Headquarters</u>		
1. Automatic Update	4	AF does three times per week
2. Invalid Transaction List	4	
3. HQ Data Security	4	Access controlled by terminal
4. End-of-Month Tape for OPM	4	Standard process now
<u>Field CPO</u>		
1. Local Workspace	4	
2. Data for Word Processing	4	
3. Interface w/ APCAPS Payroll	0	Would need to be constructed
4. Interface w/ APCAPS Manpower	0	Would need to be constructed
5. Edit During Input	4	
6. Screen-Format Input	2	"FORMS" processor may provide solution, but has proven too complicated to be used

Key to Ratings:

- 4 Fully meets requirement
- 3 Almost meets requirement
- 2 Partially meets requirement
- 0 Does not meet requirement

APPENDIX B

MEMORANDUM

DSAC-B-82-590

This is a reproduction of a memorandum from DSAC-BFA to DLA-ZS. Some marginal notes, headings and page numbers have been added to the attachments to assist the reader in relating the content of the memorandum to the main body of the report. The marginalia is separated from the original text by solid lines.

DSAC-B-82-590 (BFA/M. E. Guntzelman/(AV)850-3009/dso)

SUBJECT: Data Required for LMI Study of APCAPS versus Air Force Personnel Data System for Civilians (PDS-C)

TO: DLA-ZS

1. References:

a. DLA Civilian Personnel Functional Requirements Beyond APCAPS Capabilities, DLA-K, 13 July 1982.

b. Visit of LMI Representatives to DSAC, 30 June - 1 July 1982.

c. Visit of LMI Representatives to DSAC, 15-16 July 1982.

2. During the two visits of LMI representatives to DSAC, we were requested to furnish a variety of data concerning development and maintenance of APCAPS, hardware requirements, contractor support, etc. The handwritten note furnished as enclosure 1 was provided by LMI as a statement of their requirements. The requested information is provided in enclosure 2 to this letter along with our rationale for its development.

3. We would like to be advised as soon as possible of the cost figures developed by LMI as a result of their study.

2 Encl

cc:
DLA-KW
DLA-C

APCAPS DEVELOPMENT AND MAINTENANCE INFORMATION

The Logistics Management Institute (LMI) was awarded a contract to analyze the costs and effort associated with either expanding and using APCAPS to meet the personnel system requirements of DLA or those associated with using the Air Force Personnel Data System for Civilians (PDS-C) for the same purpose. Listed below are the various subjects or areas for which data is to be supplied by DSAC as requested by LMI to support the study. Included with the information or data supplied are the basis and/or rationale upon which it was developed, as appropriate.

It is essential to keep in mind the HQ DLA decision that Total Information System (TIS) software developed by CINCOM will be used for all on-line system development at DSAC. Because of our limited knowledge of the features of TIS, CINCOM's Client Services Representative assisted with the development of our estimates for on-line APCAPS.

1. Develop On-Line APCAPS. This area covers the estimated time required to develop on-line APCAPS using first the existing requirements previously prepared for Consolidated APCAPS (CAPCAPS) and then the expansion necessary to cover the additional requirements set forth by DLA-K. This portion of the development effort is covered in the following paragraph under "Software Development". This subject matter area also is to include any new hardware needed to support this effort.

a. Software Development. In developing the required estimates, we first considered the steps necessary for application of structured analysis techniques to the personnel system functions reflected in the Hierarchy Charts of the Functional Description (FD) for CAPCAPS. Additional functions set forth in the DLA-K requirements were then added as we assumed they would relate to existing functions to estimate the time required for full development of on-line APCAPS. Time estimates were then applied based upon our knowledge of the work effort involved in updating the FD and program development necessary to support each function. In applying time estimates, the CINCOM Client Services Representative advised that system development under TIS need not be accomplished totally through COBOL coding. Some features of TIS such as Comprehensive Retrieval and MANTIS can be applied to minimize development efforts in some areas. Using this philosophy and the representative's expertise in prior development efforts, we anticipate that approximately 25 percent of on-line APCAPS processes, interfaces and outputs would be hard-coded.

(1) Attachment 1 entitled "Projected Development Efforts" reflects the estimates which were developed. "Days" represent the number of actual workdays which "manpower" working concurrently must expend to accomplish the listed actions or steps for basic on-line APCAPS development. "New Requirements" represent additional days necessary to accomplish full development of on-line APCAPS based upon the additional DLA-K requirements. Manpower was based upon current staffing, and we expect that available employees would be divided into teams or groups containing both functional and ADP representation. These groups would work simultaneously to accomplish assigned portions of each phase of the analysis. Development efforts of those involved in DBA functions also would be accomplished simultaneously while system analysis and design are taking place.

Encl 2

(2) Attachment 2 reflects the basic personnel functions which were contained in the FD for CAPCAPS and which were used in preparing our initial on-line system development estimates. The additional functions which were extracted from management concepts contained in the DLA-K requirements are indicated with broken lines. The final placement of these additional functions within the overall framework of the Personnel Subsystem is yet to be determined.

(3) Before beginning development of on-line APCAPS, our existing FD previously developed for CAPCAPS must be updated to include regulatory and policy changes which have occurred during the last two years. During prior presentations, Air Force has offered to give us the FD which they prepared for Merit Promotion and the Applicant Supply File. We are assuming that this FD and the FD reflecting Training Subsystem Requirements can be applied to APCAPS with a minimum of change. Our FD will be updated further to include other DLA-K requirements which require additional development and for which an FD is not available.

(4) The costs to be applied to the "mandays" reflected on Attachment 1 should be based upon the DSAC Average Daily Rate. The current rate is \$101.80 plus 9.88 percent for fringe benefits.

b. Hardware Requirements. This subject covers the requirements for additional hardware necessary for operation of on-line APCAPS.

(1) DLA is in the process of upgrading computer hardware throughout the agency under the ADPER program. The hardware to be acquired through this process is expected to be capable of supporting on-line APCAPS along with other DLA Standard Automated Information Systems (AIS). We do not anticipate that additional computer(s) will be required to support APCAPS.

(2) Four Phase terminals are currently in place at most DLA Personnel Offices and are used for processing input to the existing APCAPS. This same equipment can continue to be used with on-line APCAPS.

(3) Additional hardware in the form of printers may be required if DLA-K policy is to provide for immediate printout of SF-50s and/or other selected hardcopy in the Personnel Office when personnel actions or other specific input are processed. If this is the case, a printer would be required for each operating Personnel Office using on-line APCAPS.

2. Operate and Maintain On-Line APCAPS. This subject is intended to include such factors as CPU time, analysts' salaries, and support personnel, i.e., operators, data entry persons, etc., as they relate to on-line APCAPS. Because we are in the very early stages of adopting TIS software and because of our unfamiliarity with the operation of on-line APCAPS using that software estimates in this area are difficult to make. However information is provided below concerning each of these areas.

a. CPU Time. As a part of the DLA ADPER Program, a DLA Systems Architecture Study was conducted by TRW to determine DLA's long-range resource requirements. Information for this study was obtained from DSAC and DLA-Z concerning all DLA Standard Automated Information Systems (SAIS). A representative of DARPO-I advised that the study stated that APCAPS data processing requirements for a total on-line system were 116 CPU hours per month for on-line processes and 23.2 hours per month for batch processes.

b. Analysts Salaries. In estimating data required for this portion of on-line APCAPS operation and maintenance, implementation of regulatory and policy changes, providing user assistance, documentation, and similar responsibilities were considered. New or additional developments above and beyond those currently included in the DLA-K requirements were not considered. We estimate that approximately one half of the DSAC-B staff would be involved in total APCAPS maintenance functions. Based on current strength, this would involve 37 employees with an average annual salary of \$29,381 which is the rate for a GS-11, step 5, with fringe benefits included.

c. Support Personnel. In attempting to obtain information concerning this area, we were advised that statistics are not maintained by or available in DSAC concerning the proration of computer operator's time for APCAPS processing. If such statistics are required, they may be available at individual activities. We also believe that an estimate of time spent by data entry persons is not appropriate, particularly because such work will be accomplished in the Personnel Offices as a part of their normal personnel processing; there will be no individuals specified for data entry per se.

3. Develop Interfaces To AF PDS-C. In addition to the development of interfaces, this subject includes the effort required to revise existing APCAPS to provide for continued operation of the remaining subsystems if the Personnel Subsystem is withdrawn. The effort required for each facet of this development/revision process is explained below.

a. Interface Philosophies. Interface philosophies/requirements are not available from the Comptroller who is responsible for the remaining subsystems of APCAPS. Therefore, we were requested to make basic assumptions concerning continued operation of APCAPS and document these assumptions. Our primary or basic assumption is that the withdrawal of the Personnel Subsystem should have as little impact as possible upon the operation of the remaining subsystems. All other assumptions follow on this basic assumption and are furnished as Attachment 3.

b. Analysis and Development. The CINCOM Client Services Representative estimated that the analysis of system software interfaces would require the services of one analyst for approximately one week or five workdays. The development of these interfaces would require an additional two weeks or ten workdays, this estimate depending upon the complexities of the interfaces.

c. APCAPS Revision. The revision of APCAPS to continue operation without the Personnel Subsystem requires extensive changes, particularly in the data entry area.

(1) Estimates were developed by functional specialists in the payroll, cost and manpower function for preparation of a partial FD to document requirements, to conduct functional testing, revise the users manual and conduct training. These estimates are furnished as Attachment 4. It should be pointed out that this estimate covers only the development of new inputs and the related edit/validation criteria. Existing processes and products are basically unchanged, but there will be some additional processes and products required. If a rewrite of the existing requirements also is required under Life Cycle Management (LCM) based upon DSAC policy that major system revisions be documented under LCM, additional time would be involved.

(2) Estimates also were developed by the ADP staff responsible for data entry, Management Information Systems (MIS), Personnel Subsystem, and the Payroll and the Cost Subsystems. The estimates developed for each of these subsystems are provided as Attachments 5, 6 and 7.

4. Operate and Maintain Interfaces To PDS-C. This area covers CPU time, analysts services, and the efforts of support personnel such as operators, data entry persons, etc., required to operate and maintain the remaining subsystems of APCAPS and their interface with PDS-C. Based upon our estimates of the changes required in APCAPS, i.e., the deletion of the Personnel Subsystem, the continued use of many of the existing personnel data elements by the pay and cost subsystems, and the addition of certain processes such as nonpay accumulation to replace those withdrawn with the Personnel Subsystem, we anticipate no change in the time/cost/support factors from those required to operate and maintain existing APCAPS. Since LMI indicated that current operation and maintenance costs are available from HQ data, this information is not being furnished by DSAC.

5. CONTRACTOR SUPPORT. Technical support on an as-required basis for a period of one year (not to exceed \$50,000).

PROJECTED DEVELOPMENT EFFORTS
(For Personnel Subsystem of APCAPS)

TASK	Days		Persons	Labor # Category
	New Req.	Existing		
Organization Plan		5	1	P&C
Project Plan	2	3	1	
FD Approval	40	40	3	
<u>Analysis</u>				
Training		5	7	A&D
Phase I	1	*17	7	
High Level DFD				
D.S. Description				
Functions Description				
Data Flows				
Review		2	5	
Phase II	6	*60	7	
Function Level DFD				
D.S. Modifications				
Function Description				A&D
Data Flows/Modifications				
Review		2	5	
Phase III	80	*160	7	
Primitive Level DFD				
D.S. Modifications				
Function Description				
Data Flow/Modifications				
Data Store Views				
Review		2	5	
<u>Design</u>				
Training		5	4	
Meet with DBA (Review)	1	4	4	
Transform Structure	1	4	4	
Identify Module Functions/Product	1	2	4	
Write Specs	4	6	4	
Code Modules	40	60	4	
<u>Test</u>				
Module Test (Pgm)	18	27	4	P&T
System Test (Func)	16	24	3	
Production (IOT)		20	4	
<u>System</u>				
Manuals/Walkthrus (OM)	5	20	4	D&T

Attachment 1

Attachment 1

These are the ways the categories have been assigned for this study

PROJECTED DEVELOPMENT EFFORTS
(For Personnel Subsystem of APCAPS)

User	Days		Persons	Labor# Category
	New Req.	Existing		
Manuals (UM)	20	20	4	
Training (and development)	5	Dev 10 Train 5	2 5	D&T
<u>DBA</u>				
Training		5	2	D&T
Data Dictionary Modifications		30	2	
Logical Design		15	4	A&D
Physical Design		10	4	
Directory Maintenance		10	4	I
Backup/Recov/(Design)		5	4	
Reorganization/(Design)		5	4	A&D
Implementation		5	4	I
Training				
Back/Up/Recovery		2	2	
Reorganization		1	2	D&T
<u>Hardware Analysis</u>				
Horsepower		2	1	
Storage		2	1	A&D
Direct				
Backup				
<u>Conversion</u>				
Requirements		10	3	
Implementation (Pgms)		10	1	
Study (Exec DBA)		15	2	D.C.
Total Person-days	1149	2991		
			4140	

* These are the ways the categories have been assigned for this study.

CONTINUED OPERATION OF APCAPS WITHOUT THE PERSONNEL SUBSYSTEM

ASSUMPTIONS

The existing APCAPS would be revised to have as little impact as possible upon the existing Pay, Cost and Manpower Subsystems.

Enhancements/new requirements would not be included.

All required data for DLA employees would be available from and furnished by AF PDS-C in the format and within the timing framework we specify.

Data required to process pay (and cost) for non-DLA employees paid by APCAPS would be input by the payroll function.

(Applicable to Severance Pay employees as well as employees of DCAA, DIS, etc.)

Existing PDI processes, other personnel processes and personnel products would be eliminated.

Existing philosophies concerning MAR and Tables would continue to apply.

(Some tables would require revision to accommodate payroll processes only, e.g., PAC Table to eliminate Authorities but continue to post personnel actions to automated Retirement Records.)

Edit/validation criteria would need to be developed to accommodate both manual and automated input of data elements the payroll function is assuming from the Personnel Subsystem.

(Criteria would be required for data furnished automatically from PDS-C and manually by the payroll function.)

Nonpay data applicable to WGIs, probationary periods, etc., would be accumulated and reported to personnel function by the payroll function processes for manual application by the personnel function.

Mass Pay Change processes would be applied only to non-DLA employees paid from APCAPS; Mass Pay Changes for DLA employees would be processed as individual transactions furnished by PDS-C.

Input forms/formats would require redesign by payroll function.

Documentation would require revision.

(This would include both ADP documentation and the Users Manual.)

Employees of the payroll function would require training in the new processes.

Attachment 3

PAYROLL

	<u>DAYS</u>	<u>MANPOWER</u>
Development Requirements (Partial FD) Includes: Revising some system tables, redesigning input, redesigning edit/ validation criteria. This does not include documenting existing leave edits or pay compute routines; output products.	40	3
Testing	60	4
Documentation: User Manual	10	2
Training	5	4
		Attachment 4

400 person-days

REVISION OF MIS PROCESSES/DELETION OF PERSONNEL SUBSYSTEM

1. Eliminate MINI Personnel Cycle. Some processes need to be rewritten into UPAA10, UPAA13, UPAA60 and UPAA84.
2. Eliminate UPEJBW03 and UPEJBW02 from all Biweekly 4 Pay Schedules. Some of these nonpay processes may be retained based on new Comptroller requirements - new programs or processes possible in Pay area.
3. Tables Maintenance - Eliminate Series Title Table, modify PAC, eliminate Remarks, etc.
4. Eliminate
 - a) Monthly HQ DLA Data Bank Processing Schedule
 - b) Annual History Purge Schedule
 - c) PDI Update Schedule
 - d) Personnel MIS Reports Schedule
 - e) Position Classification Survey Schedule
 - f) Personnel History Report Schedule
 - g) Employee Personnel Record Schedule
 - h) APCAPS Employee Address and ZIP Code List Schedule
 - i) Retirement Eligibles Projections Schedule
 - j) Employee Table Selector Code List Schedule
 - k) Report Program Generator Schedule
 - l) APCAPS Reorganization Schedule
 - m) Individual Minority Group Designation Schedule
 - n) Report of Individual Nonpay Data Schedule
 - o) Organization Title List Program from all Cost Schedules
5. Modify APCAPS Data Bank Update Schedule
 - a) Rewrite UPCA01 - New Comptroller Input
AF Input
 - Eliminate UPCA03
UPCA04

- b) Rewrite UPCA05 - Remove processes and records supportive for
 UPCA12 Personnel
 Reformat for new Comptroller Data and AF Data
 New sort keys for UPAA02

- c) Rewrite UPCA15 - Validation new Comptroller Input and AF Input to
 MAR

- Eliminate UPAA52
 UPAA54
 UPAA56
 UPAA58

- d) Rewrite UPAA02 - Eliminate Personnel Checks
 New AF Data Record Comptroller Data
 Change to bypass PDI processes, etc.

- e) Rewrite .UPAA05 - Redo of all Data Bank Processes
 UPAA10 validations, messages, updates, etc.
 UPAA13
 UPAA60
 UPAA96

- Eliminate UPEC65
 UPEC70
 UPEC75

- f) Rewrite UPAA82 - Redo of all Data Bank Position Data Processes and
 UPAA84 eliminate Personnel Processes
 UPAA86
 UPAA88
 UPAA15
 UPAA20

- g) Eliminate in total jobs
 UPEJWW02
 UPEJWW03
 UPEJWW04
 UPEJWW05
 UPEJWW06
 UPEJWW07
 UPEJWW08
 UPEJARC7

- h) Conversion Programs to change
 Data Bank
 MAR
 Tables

6. Redo of all Pay and Cost Processes due to reformat of Data Bank, PDI, Tables and MAR. Jobs on Data Bank Schedule and all others.

(MIS Area)

	<u>MANDAYS</u>	<u>PEOPLE</u>
Analysis	60	4
Program	80	4
Test	60	4
Implement	20	4

880 person-days

DSAC-BAA Pay Branch Impact

By accepting the AF Personnel System in lieu of APCAPS, the Payroll processing would in effect fall back to the old Segment 1 posture. If all required data elements are passed to the payroll subsystem of APCAPS, reversal would be transparent to the payroll processing. However, nonpay counters currently in the personnel subsystem would become the responsibility of the payroll subsystem. The payroll subsystem would have to keep account of all nonpay time and through various reports make this information available to the pay office to pass to the local civilian personnel offices in the same manner as was required by Segment 1 processing.

In addition, all programs which utilize the Data Bank, Master tables and the MAR files would have to be recompiled. As to the addition of the various nonpay counters and the resultant reports, the payroll subsystem would have to wait until direction is received from the functional analysts in BFB for a more accurate estimation of the time required for system changes.

A preliminary estimate of hours required for impact study is:

6 programmers at 60 days each prior to functional testing
6 programmers at 60 days each for functional testing

Attachment 6

720 person-days

Air Force Personnel System Impact on Cost Subsystem

PROGRAMS = 18:

	<u>PGMS</u>	
Use MAR	16 x 16 hrs/ea =	256 hours
Build Manpower Extract	1 x 80 hrs/ea =	80 hours
Use Manpower Extract	5 x 24 hrs/ea =	120 hours
Use Cost Extract	5 x 24 hrs/ea =	120 hours
TOTAL	=	<u>576</u> hours

Attachment 7

$$576 \text{ hours} \div 8 \frac{\text{hrs.}}{\text{day}} = 72 \text{ days}$$

APPENDIX C
DETAILED COST
ANALYSIS

Development Costs

This section provides an item-by-item description of the development costs tabulated in Table 3-2. The largest cost element for each alternative is labor. Labor estimates were furnished by several organizations with differing levels of detail. To facilitate comparison, the estimates were organized by the study team into standard categories. Table C-1 shows this organization of the original estimates, which were furnished in terms of person-days of labor.

The cost of labor during the development phase was determined by multiplying estimated working days for various development activities by a standard wage rate, and by a separate factor to reflect fringe benefits. The actual factors used were \$101.80 as an average daily labor rate and 11 percent additional for fringe benefits. The 11 percent was provided by DLA-ZSA as the number used by DLA-Comptroller for budgeting purposes. Other fringe rates were considered, but the 11 percent figure was the one selected by the Project Officer.

The \$101.80 labor rate was included in a memorandum sent by DSAC to DLA-ZS. (That document, DSAC-B-82-590, is reproduced as Appendix B.) Thus the formula used to change labor days to labor cost was:

$$\text{\$Cost} = \text{Labor days} \times \$101.80/\text{day} \times 1.11.$$

The categories under labor in Table 3-2 appear in Table C-1, with units in days instead of dollars. (An exception is the last category, APCAPS/PDS-C Interfaces, which is explained separately.) Table C-1 indicates that five different sources were used for the estimates of labor time. Those five sources for labor requirements were:

- (1) DSAC Development Plan
- (2) Training of CPOs for APCAPS

TABLE C-1. LABOR REQUIREMENTS FOR DEVELOPMENT

(Indicates number of person-days, with information source)

	<u>APCAPS</u>		<u>PDS-C</u>		<u>GSA</u>	
Planning and Coordination	250		186		186	
DSAC Development Plan		250		128		128
PDS-C Implementation Chart		-		6		6
AFMPC Staffing		-		52		52
Analysis and Design	2649		2272		2272	
DSAC Development Plan		2649		2012		2012
PDS-C Implementation Chart		-		22		22
AFMPC Staffing		-		208		208
Additional Report Requirements		-		30		30
Programming and Testing	780		680		680	
DSAC Development Plan		780		500		500
AFMPC Staffing		-		130		130
Additional Report Requirements		-		50		50
Documentation and Training	431		501		501	
DSAC Development Plan		331		221		221
Train CPO's for APCAPS		100		80		80
PDS-C Implementation Chart		-		190		190
Additional Report Requirements		-		10		10
Hardware Acq. & Installation	-		40		5	
PDS-C Implementation Chart		-		40		5
Data Conversion	70		210		210	
DSAC Development Plan		70		70		70
PDS-C Implementation Chart		-		10		10
AFMPC Staffing		-		130		130
Implementation	60		160		160	
DSAC Development Plan		60		60		60
PDS-C Implementation Chart		-		100		100

- (3) PDS-C Implementation Chart
- (4) AFMPC Staffing
- (5) Additional Report Requirements.

Not all five sources are applicable to each of the three alternatives. In particular, only the DSAC Development Plan and CPO Training are relevant to the costs of the On-line APCAPS alternative. However, the PDS-C alternatives do have costs contributed by all five sources.

The cost source that is most difficult to interpret, the DSAC Development Plan, is described below.

Attachment 1 of DSAC-B-82-590 identified DSAC's estimates for the development effort for the personnel subsystem of On-Line APCAPS. That effort was subdivided into two components: the time required to develop the existing personnel system, and the additional time required to formulate the new requirements identified by DLA-K. The effort required to convert the existing personnel system to the on-line, TIS-oriented environment is unavoidable, in the sense that it will be necessary regardless of the alternative chosen. That is because all of APCAPS (Payroll, Cost and Personnel) will be converted to the on-line design; none of the subsystems are to be excluded. Both DSAC and several sources in DLA-Z agree that this conversion must occur. The additional time to develop the new requirements, on the other hand, is a variable cost that would be avoided if one of the PDS-C alternatives is chosen.

Each function in Attachment 1 of DSAC-B-82-590 was assigned to one of seven labor categories. This assignment is found in the righthand column. Thus the first three functions have been assigned to labor category "P&C," which signifies the Planning and Coordination category of Table C-1. As an example of the computations involved, the calculation of the Planning and Coordination entry (DSAC Development Plan portion) in Table C-1 consists in

multiplying the number of days (column 2) by the number of persons (column 3) from Attachment 1 of DSAC-B-82-590, which gives the person-days for development charged to all three alternatives. Accordingly, the PDS-C entry is 128 person-days ($5 \times 1 + 3 \times 1 + 40 \times 3$). The APCAPS alternative must have an additional charge (for the new requirements), which is the product of the number of days (column 1) and the number of persons (column 3). In our example, this is 122 person-days ($2 \times 1 + 40 \times 3$). The sum of 128 and 122 is the labor requirement shown for APCAPS, 250 person-days. This same method was used for each function presented in Attachment 1 of DSAC-B-82-590.

The remainder of this section describes the methods and data used to determine the development cost of each alternative in turn. For each alternative, the development costs are identified by the categories indicated in Table 3-2 (labor, hardware, site preparation, computer time, travel).

On-line APCAPS. Almost all of the APCAPS development costs were taken from the DSAC development plan using the method outlined in the preceding paragraphs. That is, person-days were allocated among the different labor categories in Table C-1, and the labor days then converted to labor dollars. Note that the total person-days for APCAPS development (shown on the second page of DSAC-B-82-590, Attachment 1) is 4140 days.

Although the DSAC development plan included some training activities, it did not allocate any time for the training of operators at the local processing sites. A reasonable estimate for this purpose is 5 days x (18 field personnel + 2 HQ personnel) or 100 person-days, which is the entry for the APCAPS column in the Documentation and Training Category in Table C-1. When 100 days of local operator training are added to the previous subtotal of 4140 days (DSAC development time), a total labor requirement of 4240 person-days is produced. Using the standard labor-to-cost formula, we obtain

$$4240 \text{ days} \times \$101.80/\text{day} \times 1.11 \text{ (fringes)} = \$479,100.$$

This is the total labor cost for APCAPS development, as shown in Table 3-2, except for a \$100 rounding error. Since the other development costs for APCAPS were zero (see following paragraph), \$479,000 is the total development cost for On-line APCAPS.

The other categories of development costs in Table 3-2 have no entry in the APCAPS column, implying a zero cost. There is no hardware cost since no additional hardware would be purchased specifically for APCAPS. All planned hardware will be procured even if PDS-C is chosen. There is no site preparation cost for the same reason; a site will be prepared for a computer at each processing office, the cost of which will be unaffected by the alternative chosen for the personnel system.

The cost of computer time during development was treated as a sunk cost that would be independent of the kinds of applications being developed. DSAC has assigned one mainframe to be used for development programming with no charge for its use, nor tracking of usage by functional area. The travel cost for APCAPS is treated as zero as a basic assumption with the other alternatives charged an incremental amount for estimated travel costs above and beyond those that would be incurred if the APCAPS alternative were selected.

PDS-C on New DLA Hardware. As for the other alternatives, labor costs for PDS-C development and implementation were first recorded as person-day requirements in Table 3-2. Previous discussion explained the methods used to extract labor days from Attachment 1 of DSAC-B-82-590. The days are attributed to "DSAC Development Plan" in Table 3-2. An additional 100 days for training operators at local processing sites was also discussed in the section on APCAPS. Approximately 20 percent of that time would be avoided if PDS-C were chosen. Therefore the PDS-C alternative was charged for 80 person-days (100 - 20). This alternative also incurs a charge to train the operators under PDS-C; that cost is covered by the PDS-C Implementation Chart.

To adopt PDS-C for use by DLA would require effort by two primary groups, DLA staff and Air Force staff. The requirement for DLA manpower was developed through discussions with the Air Force; the details are shown in Table C-2. Each activity was associated with one of the labor categories, which are shown in the righthand column of Table C-2. The workdays in each category were then summed and placed in Table C-1, with the source designated as "PDS-C Implementation Chart."

In addition to the staff support at DLA, there is significant effort required by the Air Force to modify the PDS-C software. The Air Force estimated that their development effort in modifying PDS-C for DLA's use would require a full year of work by two analysts. These two analysts would be DLA employees assigned to work with AFMPC at Randolph AFB. In order to include their labor in the "Labor Requirements for Development" chart (Table C-1), the time of these two analysts was allocated among tasks as follows:

<u>Task Category</u>	<u>Days</u>	<u>Percent of Time</u>
Planning & Coordination	52	10
Analysis & Design	208	40
Programming & Testing	130	25
Data Conversion	<u>130</u>	<u>25</u>
	520	100

The labor allocations were entered in Table C-1, for the PDS-C alternative, with a source of "AFMPC staffing." The number of days was chosen so that the total, 520 days, when multiplied by \$101.80 (daily labor rate) and 1.11 (for fringe benefits), would result in a cost of \$58,759, essentially equal to the amount that GSA estimated it would incur for the same purpose.

Since the Air Force was unable to examine each of DLA's specific personnel system requirements and determine which requirements could be met by existing DESIREs, estimates were needed in these areas. DLA-K's requirement document contained 118 specific requirements, of which 75 percent could be met

TABLE C-2. PDS-C IMPLEMENTATION CHART

	<u>Person Days</u>	<u>Task Category</u>
Negotiate support agreements (between AF and DLA) (1 day x 2 persons)	2	Planning & Coordination
Appoint personnel systems managers (for each CPO); select staff at the central site (2 x 2)	4	Planning & Coordination
Data base analysis--comparison of APCAPS and PDS-C fields (1 x 2)	2	Analysis & Design
Transaction analysis--compare DLA requirements with existing PDS-C capabilities (5 x 4)	20	Analysis & Design
Data base conversion--transfer of APCAPS data (5 x 2)	10	Data Con- version
Time spent on hardware acquisition (5 x 4)	20	Hardware Ac- quisiton & Installation
Install and test hardware and communications equipment (10 x 2)	20	Hardware Ac- quisition & Installation
Training for CPOs 7 days x (5 DSAC personnel + 20 field personnel)	175	Documentation & Training
Training for central site staff (5 x 3)	15	Documentation & Training
Implementation (5 x 20)	<u>100</u>	Implementation
	368	

NOTE: The time requirements above do not include the assignment of two DLA employees to Randolph AFB to assist the Air Force in accommodating DLA.

through existing Air Force software and 25 percent needed to be met through new software, primarily DESIREs. The basis for the 75 percent was historical: the Navy's experience was 64 percent and GSA's was 80 percent. It was further assumed that the 30 remaining requirements (25% x 118) would require 3 days of work each. This estimate was based on examination of the coding required to produce new DESIREs. Incorporating the 90 days (30 x 3) into Table C-1, we allocated 30 days to Analysis and Design, 50 days to Programming and Testing, and 10 days to Documentation and Training. Those numbers are shown in Table C-1 in the PDS-C column with the source designated as "Additional Report Requirements."

The last labor category in Table 3-2, APCAPS/PDS-C Interfaces, consists of the time required by DSAC to modify APCAPS so that it will operate correctly without the personnel subsystem. This issue is addressed by DSAC in attachments 3, 4, 5, 6, and 7 to their document DSAC-B-82-590. Attachment 3 lists their assumptions, and the other attachments contain labor estimates in various DSAC departments. Those estimates are summarized below.

<u>Attachment to the DSAC Document</u>	<u>Department or Function</u>	<u>Person-days</u>
4	Payroll	400
5	MIS	880
6	PAY	720
7	COST	72
	Total	<u>2072</u>

Additionally, paragraph 3.b of the same document identifies 15 days as necessary for the analysis and development of system software interfaces. Thus the total effort would require 2087 workdays (2072 + 15). This time requirement was costed using the factors of \$101.80 daily rate and 11 percent fringe benefits:

$$2087 \times \$101.80 \times 1.11 = \$235,800.$$

This figure is entered (for the PDS-C alternative) for "APCAPS/PDS-C Interfaces" under the Labor section of Development Costs in Table 3-2.

As a method for verifying the total labor cost of PDS-C in Table 3-2, the calculations below recompute that number without the intermediate step of allocating the costs to the different task categories.

- From DSAC Development Chart	2991 days
- To train CPOs to use APCAPS	80
- Modification for PDS-C/APCAPS interface	2087
- AFMPC staffing (two spaces)	520
- Additional reporting requirements	90
- From PDS-C Implementation Chart	<u>368</u>
Total	6136 days

$$6136 \times \$101.80 \times 1.11 = \$693,350$$

The slight difference between this total and the total labor cost in Table 3-2 is due to roundoff in the number of days.

Hardware requirements for PDS-C were recommended by the Air Force. The smallest computer that can run PDS-C as it is presently implemented is the Burroughs 2930. It is also necessary to procure a communications processor to handle the multiple processing sites and protocol conversion if an IBM-oriented network such as DLANET is to be used. The CP-3680 is the communications processor recommended by the Air Force, and it will be used by both the Navy and GSA in their implementations of PDS-C. The configuration and cost of the recommended hardware is shown in Table C-3. The subtotals include \$283,300 for the B-2930 (and peripherals) and \$124,100 for the CP-3680 (and peripherals). The total, \$407,400, appears in Table 3-2 as the hardware cost of the "PDS-C on New DLA Hardware" alternative.

TABLE C-3. PDS-C HARDWARE

B-2930	Basic system	\$190,000	
9494-41	Disk drives, 402 MB	24,000	
9495-8	Magnetic tape units (2)	25,500	
9499-33	Tape unit controller	10,800	
9116	Card reader	33,000	
9247-14	Line printer		
			\$283,300
CP-3680	Communications processor	\$ 61,000	
3641-01	System console	3,000	
3620-03	Host interface	2,500	
3600-DCS	Data communication software	10,000	
3645-01	I/O Port expansion unit	20,000	
3631-01	Two-line Sync/Async adaptors (12)	27,600	
			<u>124,100</u>
			\$407,400

(Note: This configuration would provide 24 synchronous communication lines. These costs are taken from a 1982 Datapro publication, not from a GSA price schedule; GSA discounts may be available.)

Site preparation costs were developed with the assistance of DLA-ZSA. Two categories of costs were used, derived from a recent DLA examination of the cost involved in converting an existing structure for ADP equipment use.

- | | | |
|----|---|--------------------|
| 1. | To replace flooring:
(an estimate used for
internal purposes by DASC) | \$261,000 |
| 2. | To install ADP support:
(power, A/C, etc.) | \$800,000 |
| | | <u>\$1,061,000</u> |

Both figures were for a computer site of 4000 square feet. A Burroughs 2930 and peripherals should occupy only half that space, or 2000 sq ft. Accordingly the cost used was \$530,000, half of the amount determined above. This

accounts for the \$530,000 entered in the "PDC-S on New DLA Hardware" column for site preparation in Table 3-2.

As for the APCAPS alternative, computer time during development was treated as being cost-free. Time on the B-2930 would have no cost charged if it were purchased for this application and computer time at DSAC (to work on the PDS-C interfaces and APCAPS modifications) is not costed for development efforts.

The incremental travel cost for PDS-C would result from trips by DLA staff to AFMPC in San Antonio, or vice-versa. The \$4,500 shown in Table 3-2 was estimated from 9 trips at \$500, the approximate cost per trip.

The total for development costs for PDS-C, found by summing the labor, hardware, site preparation, and travel subtotals or \$1.6 million, is shown in Table 3-2 under the "PDS-C on New DLA Hardware" alternative.

PDS-C on Other Government Hardware. A third alternative explored the possibility of adopting the PDS-C system but avoiding the purchase of a Burroughs computer. LMI contacted Navy and GSA representatives involved in the adoption of PDS-C by those agencies. Inquires concerning the possibility of sharing time on their Burroughs equipment met with mixed responses. The Navy representatives said their machines were going to be fully utilized by their own work, with no excess capacity available for DLA's use. GSA responded more favorably; they were willing to sell DLA time on their Burroughs equipment in Anchorage, Alaska. So the third alternative in our cost analysis is an evaluation of the costs DLA would incur if selecting the PDS-C software and using a GSA facility in Anchorage as the central site. Each local processing site would communicate with the central site by ground lines (presumably DLANET) and a satellite link to Anchorage. GSA is proceeding with their plan to implement an almost identical configuration.

For purposes of brevity, the "PDS-C on Other Government Hardware" option will be referred to in this section as the "GSA alternative."

Most of the development costs associated with the GSA alternative are identical with the costs of the PDS-C on DLA hardware alternative. Only the costs that are different will be discussed. Table C-1 reveals that of the eight labor categories, only one, "Hardware Acquisition and Installation," differs for the two PDS-C alternatives. In Table C-1, 40 days were allocated for this category in the PDS-C column, but only 5 days were allocated in the GSA column. The lesser amount of time is due to the much smaller procurement effort and results in a slight cost difference.

Although the additional requirement at the GSA facility is not clearly defined, it can be estimated. The last two items on Table C-3 (I/O port expansion unit and two-line I/O adaptors) will probably be necessary to handle the 18 to 20 DLA sites that must be supported. Those two items total \$48,000. Additional tapes, disks, and perhaps a disk drive (depending on GSA untapped capacity) could reasonably be expected to bring the total up to \$60,000, the amount in the righthand column for hardware in Table 3-2. The site preparation cost for this alternative should be negligible, as the site already exists and is operating as a computer processing site.

If the system were implemented at a GSA site, there would certainly be a charge for the use of their computer during the development phase. The \$50,000 figure is a rough estimate, taking into account GSA's projected charge of \$370,000 for computer time for annual operations, and the Air Force's experience in similar development efforts.

The total development cost for the GSA alternative is \$803,800, as shown in Table 3-2. As would be expected, this alternative offers a cost savings in the development phase compared to "PDS-C on New DLA Hardware," due

to the avoidance of large equipment and site preparation charges. The trade-off appears in the operations and maintenance cost area where the GSA charge for time on its computer is noted.

Annual Operations and Maintenance Costs

The annual costs for operating and maintaining the personnel system cover five categories: labor, computer time, hardware maintenance, communications services and space for a central computer site. The labor category includes maintenance of software making up the personnel system and its interfaces with other systems, as well as operator support for the central computer facility, where applicable. It does not include the cost of time spent by personnel specialists at the field CPOs or headquarters in using the personnel system to generate reports, search the data base, enter data and related activities. How each of the cost categories applies to the system alternatives is discussed in detail in the subsections that follow.

On-line APCAPS. Under this alternative, the completed On-line APCAPS will be run at 18 DLA sites using normalized hardware and software. Each site will process personnel data for the local CPO and provide DLA headquarters access to its local data base via DLANET. A headquarters-level data base will be maintained at one of the sites, DASC, and will be furnished input data by the other 18 systems.

DSAC will continue to function in its role as a Central Design Activity. It will maintain On-line APCAPS software, perform system enhancements in response to personnel office requests, and release new versions of the system to the operating sites on a periodic basis.

Labor: \$235,000

An estimate for the annual labor required to maintain On-line APCAPS was developed by DSAC and provided to DLA-ZS in a memorandum on or about 10 Aug 82 (reference DSAC-B-82-590). The estimate included analyst salaries

for staff to perform routine software maintenance, implement policy-required and regulation-required changes, provide user assistance, maintain documentation, etc. DSAC estimated that one-half of the DSAC-B staff would be performing these maintenance activities for APCAPS. Using the current strength as a basis, the average grade for analysts performing such work is GS-11, step 5. According to DSAC, the average annual salary, including fringe benefits, for that level is \$29,381. Since there are 8 people assigned to the personnel portion of APCAPS, the total annual labor cost will be \$235,000.

Computer Time: \$27,000

The annual computer time estimate for running the personnel subsystem of On-line APCAPS is based upon data furnished by DSAC (in a memorandum to DLA-ZSA dated 26 Aug 82, reference DSAC-B-82-658). According to that memorandum, machine run time can be valued at \$6 per hour. Projected run time at each of the 18 sites is 139 hours per month for On-line APCAPS. Approximately 30 percent of the run time is allocated to the personnel subsystem. Thus, the annual computer time estimate is

$$\$6 \times 18 \times 139 \times 12 \times 0.3 = \$54,000.$$

Assuming that 50 percent of the projected machine time could be re-utilized by the sites, the opportunity cost for DLA will be approximately \$27,000.

Hardware Maintenance: \$0

The use of On-line APCAPS requires no additional major hardware and hence no other than normal hardware maintenance. According to DSAC, the hardware configuration at each of the 18 sites at which APCAPS will be operating is independent of APCAPS requirements. It will be in use and maintained anyway, so no meaningful cost can be associated with maintaining the hardware for APCAPS.

Communications Services: \$0

According to DSAC, the use of On-line APCAPS will place no additional burden upon DLANET and will require no additional communications hardware. The planned configuration of DLANET is independent of APCAPS requirements. Therefore, no share of DLANET costs, according to DSAC, can be allocated to APCAPS.

Space for Central Site: \$0

The planned On-line APCAPS requires no central computer facility.

Total Annual Operations and Maintenance Costs: \$262,000

PDS-C. Under this alternative, the Air Force PDS-C (suitably enhanced to meet specific DLA-K requirements) will be run at a central site operated by DLA. Headquarters and the field CPOs will access the system via DLANET. Interfaces with the other subsystems of On-line APCAPS will be maintained by DSAC. The DLA implementation of PDS-C will be maintained by staff assigned to AFMPC (to be paid for by a DLA support agreement).

Labor: \$411,600

There are three major components to the labor estimate. According to DSAC, there will be no difference in the level of effort required to maintain the interfaces with the payroll, cost and manpower portions of APCAPS compared to maintaining the personnel portion of planned On-line APCAPS. Therefore, the annual DSAC labor cost would be \$235,000.

Two slots would have to be assigned to the Air Force in order to support the DLA implementation of PDS-C. The grade level (GS-11/12) would be comparable with the requirements placed upon GSA, which has already entered into such an arrangement with Air Force. The support agreement dated 30 Jul 82 between GSA and the Air Force (No. JM258-82228) provided for an annual cost of \$58,700 for two civilian man-years.

A staff will have to be assigned to operate the central computer site. We estimate that the following minimum staff will be required:

- 1 site manager - GS-12
- 1 programmer/analyst - GS-11
- 2 computer operators - GS-7
- 1 librarian/clerical support - GS-7

The annual salary costs would be:

GS-12:	\$30,129	x 1	=	\$30,129
GS-11:	25,138	x 1	=	25,138
GS- 7:	16,984	x 3	=	<u>50,952</u>
Total				\$106,219

Using a fringe rate of 11 percent (as specified by DLA-KW and DLA-ZS), the annual labor cost for the central site would be \$117,900.

The total annual labor cost for operating and maintaining the PDS-C alternative would be:

\$235,000 DSAC
58,700 Air Force Spaces
117,900 DLA Central Site
\$411,600

Computer Time: \$0
PDS-C would be run on purchased hardware.

Hardware Maintenance: \$26,100
The estimates for the annual cost of maintaining the central computer site hardware were taken from the 1982 Datapro publication.

<u>ITEM</u>	<u>MONTHLY MAINTENANCE</u>
B-2930 System	\$344
9494-41 Disk Drives	78
9495-8 Tape Units (2) and 9499-33 Controller	215
9116 Card Reader	78
9247-14 Line Printer	413
Disk Controller	66
DLPs	100
CP-3680 Communications Processor	450
3641-01 System Console	25
3620-03 Host Interface	15
3645-01 I/O Port Expansion	175
3631-01 Sync/Async Adaptors (12)	<u>216</u>
Total Monthly	\$2,175

According to these figures the total annual hardware maintenance cost would be \$26,100.

Communications Services: \$360,000

The estimate for communications costs of the PDS-C alternative is based upon data provided by DSAC-B (reference DSAC-B-82-658) and verified verbally by DSAC-R. The rationale underlying the estimate follows. The PDS-C concept requires a central computer site with which the field CPOs and headquarters will communicate by a telecommunications network, DLANET. All routine transaction volume would travel over DLANET. Under the APCAPS alternative, local processing would be performed at the local site, imposing minor traffic demand upon DLANET.

DSAC stated that the capacity of DLANET will be fully utilized by currently planned applications. DSAC expects that the extra traffic volume introduced by PDS-C would necessitate the equivalent of an additional 9600 bps capacity on DLANET. The estimated monthly cost is \$30,000 yielding an annual communications cost of \$360,000.

Space for Central Site: \$192,000

Space will be required for the central computer site. Approximately 2000 sq ft will be adequate for this purpose. Data for the allocated cost of a square foot of such office/equipment space was not readily available from DLA, so an estimate of the cost of leasing commercial office/equipment space was used: \$8 per sq ft per month. This yields a total annual cost of \$192,000 for the central site space.

Total Annual Operations and Maintenance Costs: \$989,700

PDS-C Using GSA Facility. Under this alternative, DLA would use the Air Force PDS-C as in the previous alternative, but the central computer site would be operated by GSA, which is already implementing PDS-C for its own use. Because the GSA computer facility has sufficient excess capacity to support a personnel application the size of DLA's, it is possible that DLA could purchase computing services from GSA for this purpose. The cost of obtaining and operating a central computer system and central site would be traded off with the cost of purchasing services from GSA.

Labor: \$293,700

The two labor components for PDS-C and APCAPS interface software maintenance would remain. However, the cost of a central site staff could be avoided, reducing that labor estimate for PDS-C by \$117,900.

Computer Time: \$370,000

The computer time estimate furnished by GSA is based upon the following concepts. The number of user sites (field CPOs and headquarters) is approximately the same for DLA and GSA. The processing volume under PDS-C would be approximately the same. The GSA estimate of annual computer service costs that GSA will charge internally is \$370,000.

Hardware Maintenance: \$2,400

Based upon the 1982 Datapro published costs, estimates for hardware maintenance costs were derived for the peripheral equipment DLA would be required to install at the GSA computer site. The annual cost for maintaining the tape and disk drives and controllers was estimated to be \$2,400.

Communications Services: \$392,400

Under this alternative, DLA users would communicate with the central site via DLANET. The base cost of \$360,000 for DLANET upgrading is based upon the same assumptions

as provided for PDS-C above. The GSA computer facility in Anchorage would have to be linked to one of the nodes in the DLANET. A dedicated satellite communications channel would have to be made available for this purpose. According to the GSA Seattle Region, the Alascom tariff rate for such a link would be \$2,700 per month from Anchorage to any site in the lower 48 states. This produces an annual cost of \$32,400 for the additional communications requirements. The annual total for communications services would therefore be \$392,400.

Space For Central Site: \$0

There will be no direct cost for a central site.

Total Annual Operations and Maintenance Costs: \$1,058,500

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